CRANE TESTING REQUIREMENTS FOR PERFORMANCE TESTS

1. Performance testing includes both operational performance testing and load performance testing. The following tables and their associated guidelines are of a general nature. For any crane, the manufacturer's guidance has precedence over this general guidance and the manufacturer's guidance shall be followed.

2. The following sequence and limitation shall be complied with when conducting performance tests:

a. Test rigging first.

b. Conduct the operational performance test before the load performance test.

c. Test the main hoist before testing the auxiliary or whip hoists.

d. Test loads shall be raised only to a height sufficient to perform the test.

3. Operational performance testing. Operational performance testing shall include the tests specified in Table I-1, as defined below.

X1 = load hoist operation and limit switch test. (1) raise the load hook through all controller points stopping below the upper limit switch (where applicable); (2) slowly raise load hook into the upper limit switch to establish that limit switch is operating properly; (3) slowly raise hook through the upper limit switch by using limit switch bypass (where applicable); (4) lower load hook below the upper limit switch using all the lowering control points; (5) slowly lower load hook into the lower limit switch to establish that limit switch is operating properly.

X2 = boom hoist operation and limit switch test, fixed boom. (1) raise boom through all controller points, stopping below upper limit switch; (2) slowly raise boom into the upper limit switch; (3) lower boom below upper limit switch and raise boom through limit switch by using limit switch bypass (where applicable); (4) lower boom through all controller points, stopping above lower limit switch (where applicable); (5) slowly lower boom into the lower limit switch (where applicable); (6) raise boom above lower limit switch and lower boom through limit switch by using limit switch bypass (where applicable).

X2t = boom hoist operation and limit switch test, telescopic boom. In addition to test X2, conduct the following: (1) extend and retract telescoping boom sections the full distance of travel; (2) check the radius indicator by measuring the radius at the minimum and maximum boom angle.

X3 = luffing drum pawl test. (1) check luffing drum pawl for proper engagement in ratchet gear and with limit switch; (2) ensure luffing drum pawl is disengaged; (3) check the luffing drum pawl limit switch (if installed) for proper operation by operating the boom hoist and manually (at the pawl) activating the limit switch; (4) check that boom hoist motor shuts off, brake engages, and indicator lights operate correctly (where applicable). *CAUTION: do not engage pawl in the ratchet gear*

X4 = rotation lock test (wind lock, spud lock). (1) engage rotation lock and inspect to ensure full engagement; (2) check that rotation lock limit switches (clockwise and counterclock-wise) prevent engaging rotation drive (where applicable); (3) operate rotation lock bypass (clockwise and counterclockwise) to ensure proper operation (where applicable. *CAUTION: use only enough power to check operation of bypass; ensure rotation lock is disengaged prior to continuing test. NOTE: applicable switches may be operated manually to check for correct operation in lieu of engaging rotation lock*

X5 = rotation test. Rotate clockwise and counterclockwise with boom at minimum radius.

X6 = travel test. Conduct operation travel test as prescribed in L14, except without load.

X7 = deadman control test. Test all deadman controls (where installed): (1) start each motion; (2) release deadman control - motion should stop.

X8 = trolley test. (1) trolley the allowable length of the trolley runway using all control points; (2) operate trolley into the limit switches at slow speed; (3) bring trolley back, and by using the limit switch bypass move trolley into the outboard rail stops; (4) repeat above procedure for inboard limit switches and rail stops.

X9 = bridge test. (1) operate the bridge travel controller through all points in both directions; (2) operate the full distance of the runway and slowly contact the runway rail stops with the crane bridge bumpers.

X10 = other motions test. Test other motions, including swing, by operating through one cycle (one full revolution of major components).

4. Load performance testing. Load performance testing shall include the tests specified in Table I-1, as defined below.

L1 = stability test. During tests L2m, L3m, L5, and L11, observe roller clearance and roller lift-off from roller path.

L1v = stability test, variable-rated crane. Conduct tests L2m, L3m, and L11 with test load on main hoist at maximum radius of the crane: observe roller clearance and roller lift off from roller path.

L2m = load and boom hoist static test, main hoist. (1) raise test load to clear ground and hold for 10 minutes with boom at maximum radius; (2) rotate load to check bearing operation; (3) do not engage boom or load hoist pawl; (4) observe lowering that may occur which indicates malfunction of boom or hoisting components or holding brakes.

L2a = load hoist static test, auxiliary hoist. (1) raise test load to clear ground and hold for 10 minutes without hoist pawl engaged; (2) rotate load to check bearing operation -

observe lowering that may occur which will indicate malfunction of hoisting components or holding brakes.

L2w = load hoist static test, whip hoist. (1) raise test load to clear ground and hold for 10 minutes; (2) rotate load to check operation of bearing - observe lowering that may occur which will indicate malfunction of hoisting components or holding brakes.

L2z = load hoist static test, main hoist, mobile crane. (1) raise test load to clear ground with boom at **minimum radius** and hold for 10 minutes without boom and load hoist pawls engaged; (2) rotate load and hook to check bearing operation; (3) observe any lowering that may occur which may indicate a malfunction of boom or hoisting components, brakes, or outriggers. *NOTE: for hydraulic cranes, test shall be performed with boom fully retracted and fully extended*

L3m = load hoist dynamic test, main hoist. (1) raise and lower test load on each hoist controller point and visually observe smooth control between points; (2) lower the test load to unload the hoist components, wait five minutes, and continue testing.

L3a = load hoist dynamic test, auxiliary hoist. raise and lower test load on each controller point and visually observe smooth control between points.

L3v = load hoist dynamic test, main hoist, variable-rated crane. Conduct test L3m at the maximum radius of the crane.

L3w = load hoist dynamic test, whip hoist. Raise and lower test load on each controller point and visually observe smooth control between points.

L4 = wire rope test. During either the static or dynamic test, where possible, test the entire working length of the wire rope.

L5 = boom hoist operating test. Visually observe for smooth rotation between boom controller points: (1) starting from maximum radius, raise the boom to minimum radius using all boom controller points; (2) lower the boom through all controller points.

L5z = boom hoist operating test, mobile crane. Operate the boom from the minimum radius to maximum radius for the load applied; for hydraulic cranes, test shall be performed with boom fully retracted and fully extended; perform test at both maximum test load for crane and for maximum test load at maximum radius of crane.

L6 = hoist foot brake test (hydraulic or mechanical brake). Lower test load, using first control point, then apply the foot brake: this should stop the lowering motion of the test load. *CAUTION: not applicable to load-sensitive reactor type hoist controls*

L6b = hoist load brake. (1) raise test load approximately 1.5 m (5 ft); (2) with hoist controller in the neutral position, release (by hand) the holding brake - the load brake should hold the test load; (3) again, with holding brake in the released position, start the test load down (first point) and return the controller to off position as the test load lowers - the load brake should prevent the test load from accelerating. *NOTE: it is not necessary for the load brake to halt the downward motion of the test load*

L7 = boom foot brake test (hydraulic or mechanical brake) (1) start with boom near maximum radius and with test load approximately 0.6 m (2 ft) from ground surface; (2) lower test load using the first control point of the boom hoist; (3) apply the foot brake - this should stop the lowering motion of the boom and load. *CAUTION: not applicable to load-sensitive reactor type hoist controls*

L8 = automatic boom brake (where applicable). This brake is to prevent a "free" boom in case of failure of clutch, boom hoist control, and foot brake: (1) raise the boom to minimum radius and with the test load approximately 100 mm (4 in) above the ground, set the boom foot brake firmly; (2) release the mechanical boom dog; (3) release the boom clutch by operating the boom hoist control; (4) slowly release the foot brake to the free position; (5) hold the test load with automatic brake for 5 minutes, then lower test load by applying the boom hoist clutch and lowering with the controller operation.

L8v = automatic boom brake, variable-rated crane (where applicable). Conduct test L8 at the maximum radius of the crane.

L9 = load hoist loss of power (panic test). This test is designed to test the reaction of a hoisting unit in the event of power failure during a lift: (1) hoist the test load approximately 3 m (10 ft) above the ground at maximum allowable radius; (2) lower test load at slow speed and with the controller in the slow lowering position, disconnect the main power source by pushing the main power stop button(s); (3) return the controller to the neutral position - the test load should stop lowering when the controller is placed in the neutral position. *CAUTION: this test is not to be performed on cranes that do not have powered-down boom and load hoists*

L9b = load hoist loss of power (panic test). This test is designed to test the reaction of a hoisting unit in the event of power failure during a lift: (1) hoist the test load to convenient distance above the surface; (2) lower test load at slow speed and with the controller in the slow lowering position, disconnect the main power source and return the controller to the neutral position - the test load should stop lowering when the controller is placed in the neutral position. (NOTE: air operated hoists should be vented during this test.

L10 = boom hoist loss of power (panic test). This test is designed to test the reaction of the boom hoist in the event of power failure during a lift: (1) hoist the test load approximately 3 m (10 ft) above the ground with the boom near maximum radius; (2) lower the boom at slow speed, disconnect the main power source by pushing the main power stop button(s), then return the controller to the neutral position - the boom should stop lowering when the controller is placed in the neutral position. *CAUTION: this test is not to be performed on cranes that do not have powered down boom and load hoists*

L11 = rotation test. Start with the boom at maximum radius, rotate left and right 360o. (NOTE: if test area will not permit, two complete revolutions of the swing pinion is considered adequate.) *CAUTION: care should be exercised when rotating loads over the water and ensure during the initial load-test the floating crane has adequate draft readings per design data*

L12 = rotate brake test. Rotate left and right at slow speed and apply brakes, individually, periodically during rotation: each brake should demonstrate its ability to stop the rotating motion in a smooth, positive manner.

L13 = travel motion test. This test shall be conducted with the boom at maximum allowable radius positioned 90° with the crane rails and boom dog engaged. *CAUTION: operate crane at very slow travel speed; ensure track and supporting foundation are sound and free of any obstructions over the test travel areas (not applicable to floating cranes)*

L14 = travel operation test. (1) with the test load raised to clear the ground and with the boom centered between the crane rails and the boom dog engaged, travel in one direction a minimum of 15 m (50 ft); (2) operate the controller through all controller points - the crane should accelerate and decelerate smoothly and all motions should be smooth and positive; (3) repeat in the opposite direction.

L15 = trolley motion test. (1) raise test load to clear ground and move trolley to the maximum allowable radius - do not move trolley beyond the trolley limit switch; (2) hold test load for 10 minutes; (3) lower test load to ground until hoist lines are slack; (4) wait 5 minutes, raise test load and trolley the allowable length of the trolley runway.

L15b = trolley motion test. Operate trolley with test load (if space is available) the full distance of the bridge rails using extreme caution: observe proper brake operation.

L16 = bridge motion test. Operate bridge with test load (if space is available) the full distance of the runway using extreme caution and observe for any binding of bridge trucks and for proper brake operation.

L17 = hydraulic crane slippage. (1) lift the test load at maximum radius and allow time for fluid and component temperatures to stabilize; (2) hold the load for 10 minutes without use of controls by the operator - there shall be no significant lowering of the load, boom, or outrigger beams due to components or systems malfunction or failure during the test.

L18 = free-rated load test. This is a test to check stability of crane and operation of crane carrier, wheels, tires, tracks, brakes, etc., under load. (Note: retract outriggers prior to beginning free-rated load test.): (1) hoist maximum free rated test load at its maximum radius over the rear; (2) rotate through the "over the rear" working arc and travel a minimum of 15 m (50 ft) with test load over the rear of crane with boom parallel to the longitudinal axis of the crane carrier; (3) hoist maximum free rated test load at its maximum radius over the side; (4) rotate through the full working range and travel a minimum of 15 m (50 ft) with test load over the left and right side of the crane carrier with the boom 90° to the axis of travel.

L19 = primary and secondary holding brakes. For cranes with primary and secondary holding brakes (configuration of crane where a primary brake actuates when controller is returned to the neutral position and secondary brake actuates a few seconds later)

and/or eddy current hoist dynamic load brakes): (1) during either the static or dynamic test, raise the test load and observe the proper timing sequence in the application of the primary and secondary brake when controller is returned to neutral (visually observe both hoist holding brakes to ensure correct position); (2) raise test load approximately 0.3 m (1 ft), hold for 10 minutes, and inactivate the secondary holding brake while testing the primary holding brake - observe for noticeable lowering of test load that may occur which will indicate malfunction of hoisting components or brakes; (3) re-engage secondary holding brake and release the primary holding brake and hold for 10 minutes - observe for noticeable lowering of test load that may occur which will indicate malfunction of hoisting components or brakes; (4) re-engage the primary holding brake - recheck proper operation of time delay and ensure smooth positive stopping.

L20 = hoist dynamic load brake (eddy current). Check lowering speed against specifications to ensure correct brake operation. (NOTE: Eddy current brakes will not stop motion.)

L21 = swing test (where applicable). Swing the test load (where space is available) through the working range at maximum radius, stopping the load at several points: there should be no excessive drift of jib or trolley at any of these points (the significance of drift shall be evaluated).

Crane Performance Testing Requirements -No-Load Tests

Crane Performance Testing Requirements -At Load Tests

REQUIREMENTS FOR BOOM STOP TESTS

Boom stop tests shall follow these steps.

Step 1: check for availability of appropriate operator manual.

Step 2: make sure crane is level with outriggers (if so equipped) in place.

Step 3: check boom and boom stops for misalignment, bent parts, and other physical damage.

Step 4: check boom stop pins (at connections) for lubrication, wear, and damage.

Step 5: check boom angle indicator with inclinometer for correctness.

Step 6: check boom hoist disengaging device for proper adjustment and proper angle in accordance with the operator's manual.

Step 7: check for proper operational setup of the boom stops and boom hoist disengaging device. Physically boom up the boom just to the points listed below as long as the boom does not go beyond the point of operation of the boom hoist disengaging device. It is not the intent of this test to override the boom hoist

disengaging device.

a. For cantilever or scissors types, this is the point just before the boom and boom stops touch.

b. For telescoping types, this is the point just prior to compression.

APPENDIX J